User's Manual

GMS-G

GPS MMC Data Logger

V1.0

Federal Communications Commission (FCC) Statement

This Equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning:

[A shielded-type power cord is required in order to meet FCC emission limits and also to prevent interference to the nearby radio and television reception. It is essential that only the supplied power cord be used.]

[Use only shielded cables to connect I/O devices to this equipment.]

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

[ ]: depend on EUT condition.

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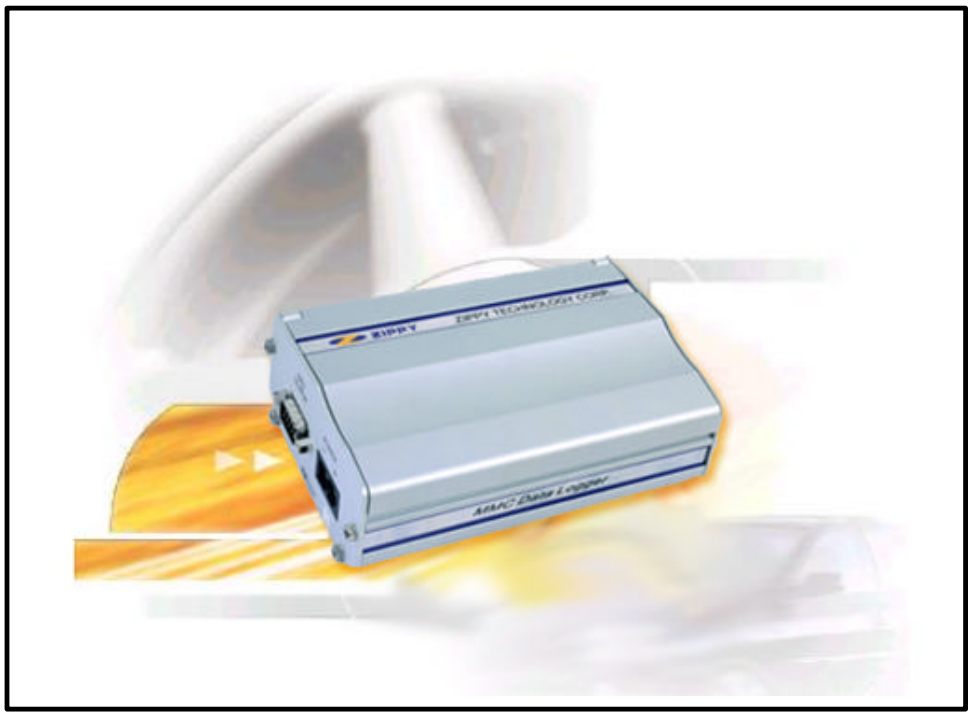
1. Introduction

1.1 General

GMS-G GPS MMC (MultiMedia Card™) data logger is the high quality and professional tool for fleet management with efficiency and safety concerns. With the built-in GPS engine and MMC (Multi-Media Card) up to 128 MB (default 32 MB), users can continuously and accurately record and traveling routes in forms of date, time, longitude, latitude, speed, and satellites status.

With its configurable switches design, users can set those recording interval and logged messages of interests. Moreover, Off-line fleet management with these traveling information will bring users benefits performing optimal routes planning, fuel control, personal dispatching, and trajectory monitoring.

In addition, the default NMEA-0183 logging format is convenient for users to do post processing with 3rd party or compatible data analysis software in host side.



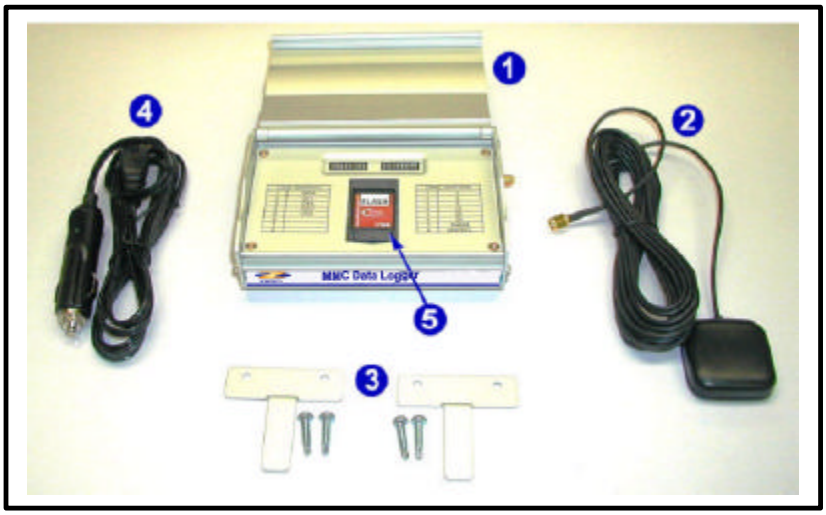
1.2 Features

With the state-of-the-art friendly design consideration for a variety of applications, **GMS-G** has the following features:

- 12 channel GPS satellite continuous tracking
- Flexible log record interval from 3 seconds (default setting) to 68 minutes
- Flexible log NMEA messages selection (default RMC sentence recording)
- State-of-the-art 32 MB MMC card log data design *(64 MB, 128 MB upon customer's inquiry)* for off-line post processing applications
- Real time monitoring with extended GPS message output via RS232 cable connection in host side (*upon customer's inquiry)*
- Extended 1 PPS signal output feasibility (*upon customer's inquiry)*
- 12~24VDC power design allows versatile vehicles installation
- Rugged housing design mitigate violating or damage impact

1.3 Basic Diagram

With the dedicated design for off-line recording data analysis from vehicle purpose, provides users full **GMS-G** package at easy operation and installation. Please refer to the following diagram and peripherals:



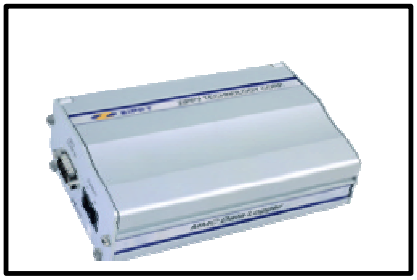
1.4 Reliability and Compliant Standard

As for reliability of **GMS-G**, it has been certified and compliant with CE/FCC Class B. Based on high quality product assurance policy, **GMS-G** can meet a variety of many applications, especially for those rugged or harsh environments.

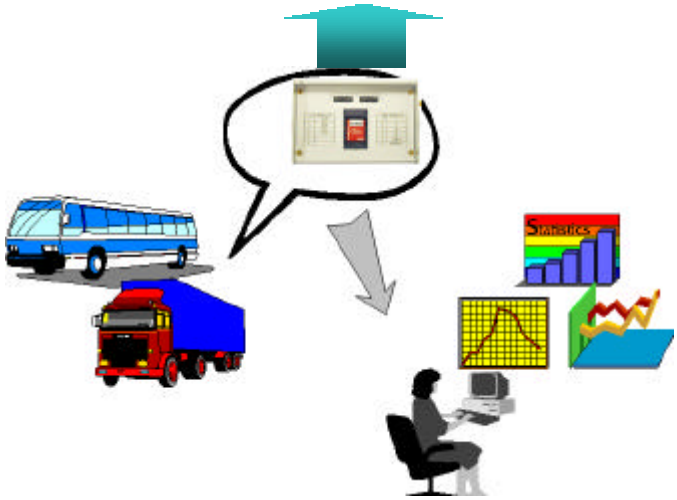
1.5 Applications

In general, **GMS-G** can satisfy a wide variety of application for vehicle navigation, tracking, fleet management, or real time monitoring. Its interior superior hardware/software architecture supports advanced capabilities for all customers through specific requirements. Below are summarized applications as:

- Real time Personal navigation with 3rd party E-map on PC, Notebook PC, or PDA platform
- Data recordings in transportation and fleet management
- Trajectory monitoring
- Over speed monitoring
- Safety protection under pre-defined area
- Efficient tool for cost-effective fleet management, transportation, and logistics
- Optimal platform for routes planning, fuel control, dispatching
- Trajectory monitoring for time, Lat, Lon, speed, heading, satellites information



GMS-G
GPS MMC Data Logger



1.6 Technical Specification

General	**GMS-G**
MMC Support	Default: 32 MB Optional: 64 MB, 128 MB Version supported: v1.4, v3.0
File System	FAT-16
Logged data (message) format	NMEA-0183 Default: RMC Optional: GGA, GLL, GSA, GSV, VTG
Log Record Interval (resolution)	3 seconds (minimum) to 68 minutes
Power Supply	+12~ 24 VDC
Power Consumption	Less than 2 watt (w/ antenna)
Physical	Compact and robust housing design
Dimension (mm)	94.5 (W) x 136.0 (D) x 45.0 (H)
Weight	340 g
Operating Temp	0°C to +70°C
Humidity	95% R.H.
EMI/EMC	CE, FCC
Optional extended GPS message output	Baud rate: 4800 bps Protocol: NMEA-0183 RMC, GGA, GLL, GSA, GSV, VTG Signal: 8 N 1 Signal Format: TX ONLY (RS232 level) 1 PPS signal output

Specifications are subject to change without notice

1.7 Software Interface (NMEA Message Sentences)

NMEA-0183 format as defined by the National Marine Electronics Association (NMEA), Standard For Interfacing Marine Electronic Devices, Version 2.20, January 1, 1997.

Table 1 NMEA-0183 Output Messages for **GMS-G**

NMEA Record	Description
GGA	Global positioning system fixed data
GLL	Geographic position - latitude/longitude
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
VTG	Course over ground and ground speed

GGA--- Global Positioning System Fixed Data

Table 2 contains the values for the following example:

$GPGGA,161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M, , , ,0000*18

Table 2 GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 3
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoid Separation		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

Table 3 Position Fix Indicator

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

GLL--- Geographic Position – Latitude/Longitude

Table 4 contains the values for the following example:

$GPGLL,3723.2475,N,12158.3416,W,161229.487,A*2C

Table 4 GLL Data Format

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR> <LF>			End of mes End of message termination

GSA---GNSS DOP and Active Satellites

Table 5 contains the values for the following example:

$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5*33

Table 5 GSA Data Format

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 6
Mode 2	3		See Table 7
Satellite Used in solution	07		Sv on Channel 1
Satellite Used in solution	02		Sv on Channel 2
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

Table 6 Mode 2

Value	Description
1	Fix not available
2	2D
3	3D

Table 7 Mode 1

Value	Description
M	Manual- forced to operate in 2D or 3D mode
A	Automatic-allowed to automatically switch 2D/3D

GSV---GNSS Satellites in View

Table 8 contains the values for the following example:

$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71

$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41

Table 8 GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Messages[1]	2		Range 1 to 3
Message Number[1]	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1 (Range 1 to 32)
Elevation	79	Degrees	
Azimuth	048	Degrees	Channel 1 (Maximum 90)
SNR (C/No)	42	DBHz	Channel 1 (True, Range 0 to 359)
Satellite ID	27		Range 0 to 99, null when not tracking
Elevation	27	Degrees	Channel 4 (Range 1 to 32)
Azimuth	138	Degrees	Channel 4 (Maximum 90)
SNR (C/No)	42	DBHz	Channel 4 (True, Range 0 to 359)
Checksum	*71		Range 0 to 99, null when not tracking
<CR> <LF>			End of message termination

1. Depending on the number of satellites tracked multiple messages of GSV data may be required.

RMC---Recommended Minimum Specific GNSS Data

Table 9 contains the values for the following example:

$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10

Table 9 RMC Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPRMC		RMC protocol header
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	**True**
Date	120598		ddmmyy
Magnetic Variation		degrees	E=east or W=west (Not shown)
Checksum	*10		
<CR> <LF>			End of message termination

VTG---Course Over Ground and Ground Speed

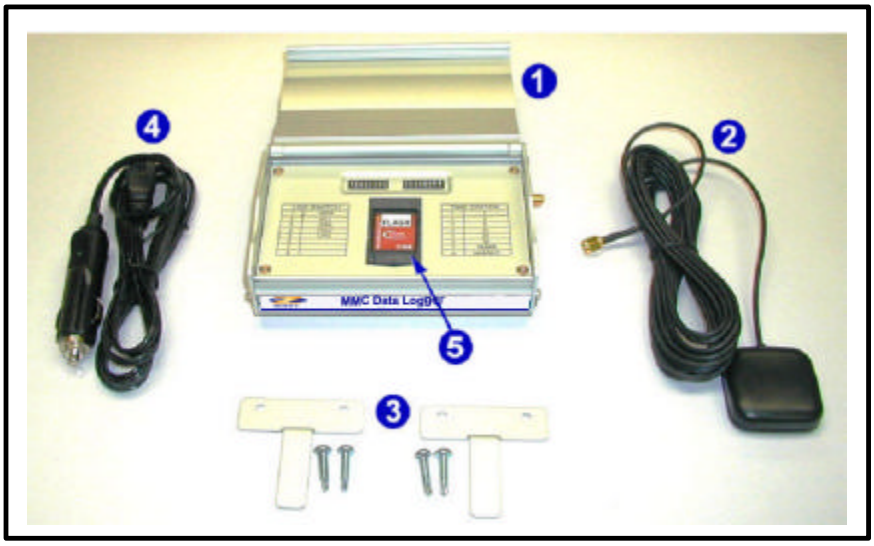
Table 10 contains the values for the following example:

$GPVTG,309.62,T, ,M,0.13,N,0.2,K*6E

Table 10 VTG Data Format

Name	**Example**	**Units**	**Description**
Message ID	$GPVTG		VTG protocol header
Course	309.62	degrees	Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	*6E		
<CR> <LF>			End of message termination

2. Activate GMS-G GPS MMC Data Logger

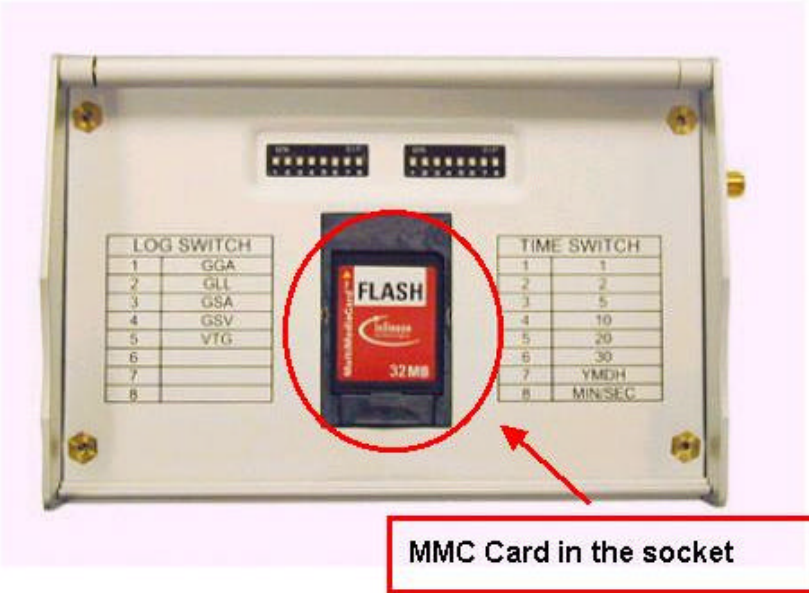


1. **GMS-G** Unit
2. 5-meter GPS active antenna, magnetic base
3. Fixing peripherals (and screws)
4. Car cigarette lighter power cord input 12 ~ 24 VDC
5. 32MB MMC data logging card *(64 MB, 128 MB upon customer's inquiry) (support version 1.4 and 3.0)*

2.1 Basic Installation of GMS-G Unit

2.1.1 Install and Replace MMC Data Logging Card

The MMC card has been installed into socket for **GMS-G** standard package unit (see below).



Below is the guideline for users to replace MMC Card with new one:

Step 1. Open the **GMS-G** cover.

Step 2. Push MMC socket lever, the MMC will spring from the socket

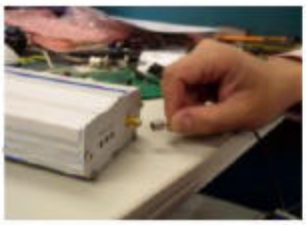
Step 3.Replace the MMC card with new one, press it until MMC socket lever is locked

Step 4. Close the **GMS-G** cover

2.1.2 GMS-G Placement and Antenna Connection

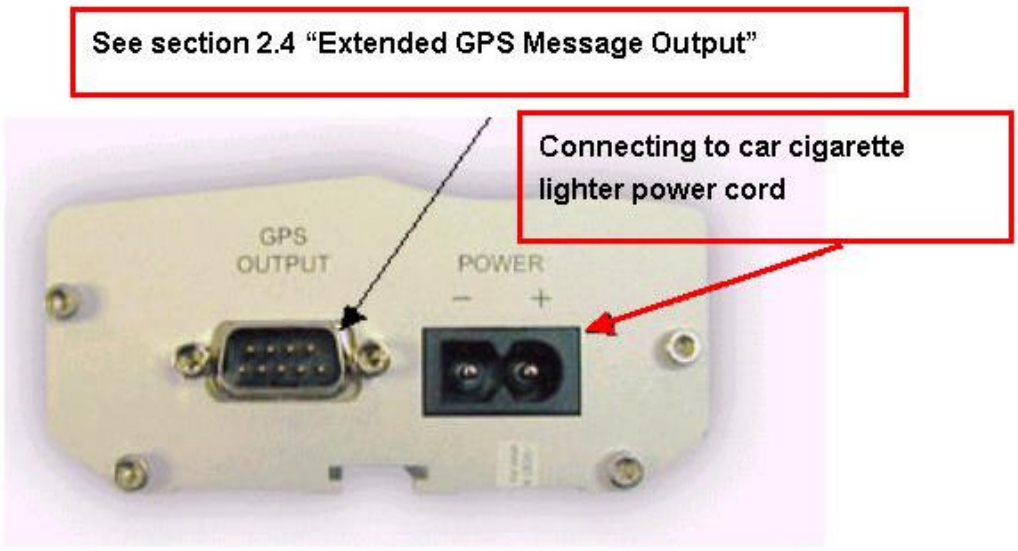
Step 1. Fix **GMS-G** unit at proper location with **fixing peripherals**

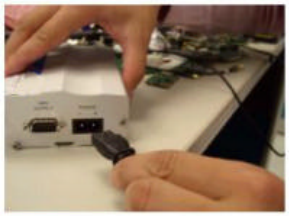
Step 2. Connecting **5-meter GPS active antenna** (with magnetic base)

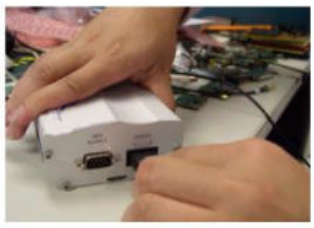


2.1.3 Connecting Power Supply

Use Car cigarette lighter power cord (+12 ~ 24 VDC) for power supply.

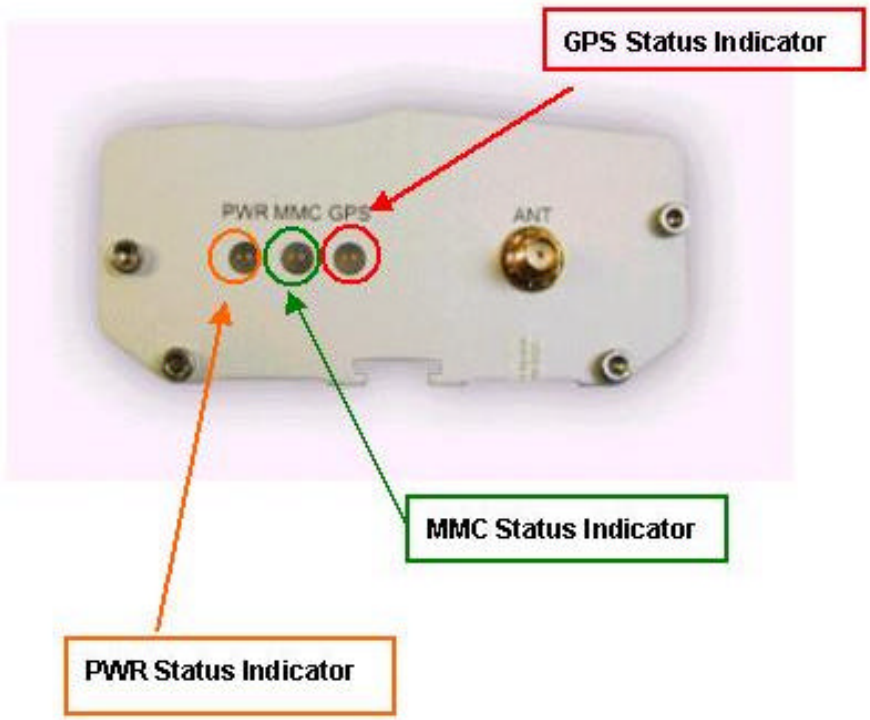






2.2 Three LED Status Indicators for MMC Card, Antenna Connection, and Power Supply

In the front panel of **GMS-G**, there are three LED status indicators that depict the real time **GMS-G** status: MMC card installation, GPS position data validity status, and data writing process integrity with different colors combination and appearance.



2.2.1 Incorrect Installation

Once the MMC card does **NOT EXIST** in the socket OR installed **INCORRECTLY**, the color for ALL three indicators will be RED!! In this case, please check if the MMC card is correctly installed. Also check power supply and antenna connection.

2.2.2 Status Indicators Table

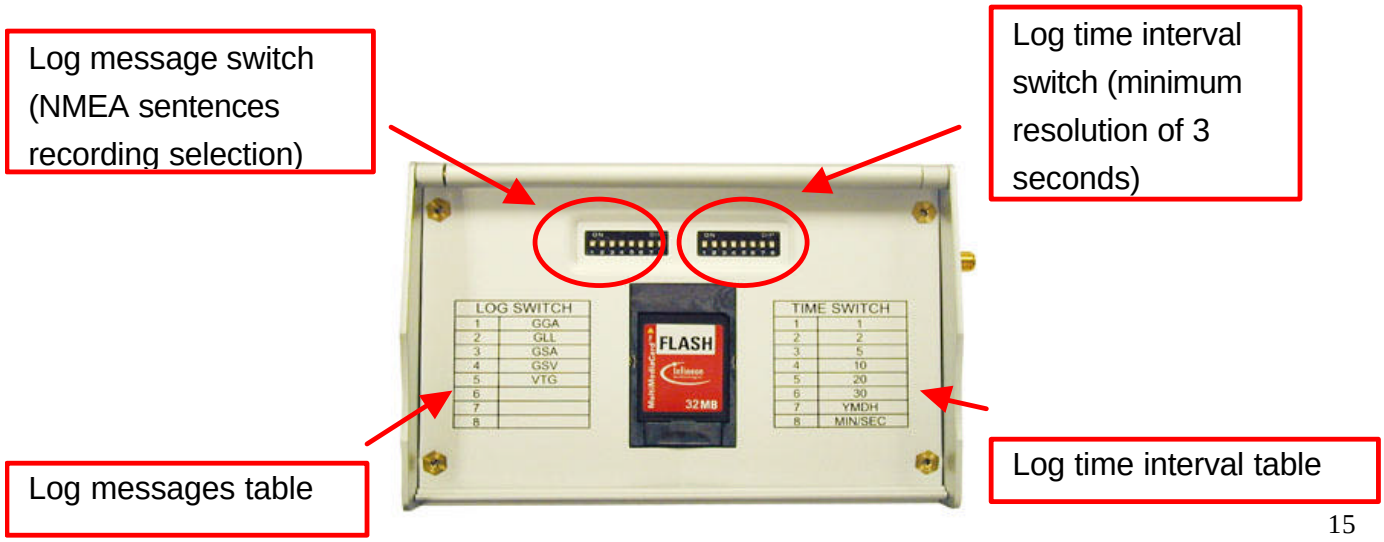
Below is the table to describe different real time **GMS-G** status.

Status (see Note 1)			Description
R	R	R	MMC card does NOT EXIST, OR not installed correctly
O	G	R	Valid GPS position data is NOT available yet (Usually it should take 3 or 4 minutes to track sufficient GPS satellites information to obtain valid position data)
O	G	G	Valid GPS position data is available
O	R	N	Writing GPS position data into MMC card (only when valid GPS position data is available) (see Note 2)

Note 1: The Color Abbreviation list is: R (RED), O (ORANGE), and G (GREEN)

Note 2: Once the writing process is failed (into MMC card) at certain time of moment, the PWR status indicator will be R (RED).

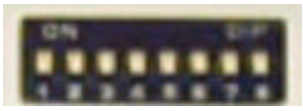
2.3 Configurable Logging Switches



2.3.1 Log Time Interval Switch

ON

OFF



1 2 3 4 5 6 7 8 SW (DIP Switch)

The "Log time interval switch" sets the log record interval rate of interests into MMC card with the resolution ranging from 3 seconds (minimum record interval) to 68 minutes (maximum record interval). Users can refer to the accompanied "Log time interval table" as:

TIME SWITCH	
1	1
2	2
3	5
4	10
5	20
6	30
7	YMDH
8	MIN/SEC

SW 1, 2, 3, 4, 5, 6: These six DIP switches set the recording rate value of interests. The actual recording rate value is the summation of those SWs with ON status. **DEFAULT is 3 seconds (SW 1, 2 ON).**

SW 8: This DIP switch sets recording rate unit. While SW is set ON, it means the recording rate unit is "minute" (MIN); while SW is set OFF, it means the unit is "second" (SEC). **DEFAULT is SEC (SW 8 OFF).**

Example**:**

- Recording rate – 15 seconds: SW 3, 4 ON
- Recording rate – 3 minutes: SW 1, 2, 8 ON

SW 7: This DIP switch sets the recording file nomination. **DEFAULT is ON.**

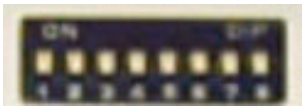
Example: At the time moment of UTC time 2002/06/09 12:00:00

- If SW 7 is set OFF: the recording file name will be 02060912.DAT
  It suits to record short time, i.e. one week
- If SW 7 is set ON: the recording file name will be 020609##.DAT
  It suits to record long time.

2.3.2 Log Message Switch

ON

OFF



1 2 3 4 5 6 7 8 SW (DIP Switch)

The "Log message switch" sets the log record of NMEA-0183 sentences into MMC card. The default log record is NMEA-0183 RMC sentence. Users can refer to the accompanied "Log message table" as:

LOG SWITCH	
1	GGA
2	GLL
3	GSA
4	GSV
5	VTG
6	
7	
8	

SW 1, 2, 3, 4, 5: These five DIP switches set the recording NMEA-0183 sentences of interests when separate SW is ON. From SW 1 to SW 5, it corresponds recording GGA, GLL, GSA, GSV, and VTG sentences separately. NMEA-0183 sentence information can be referred to section 1.7.

Example:

- SW 1 ON / OFF: GGA record ON / OFF
- SW 2 ON / OFF: GLL record ON / OFF
- SW 3 ON / OFF: GSA record ON / OFF
- SW 4 ON / OFF: GSV record ON / OFF
- SW 5 ON / OFF: VTG record ON / OFF

2.4 Extended GPS Message Output (Optional)

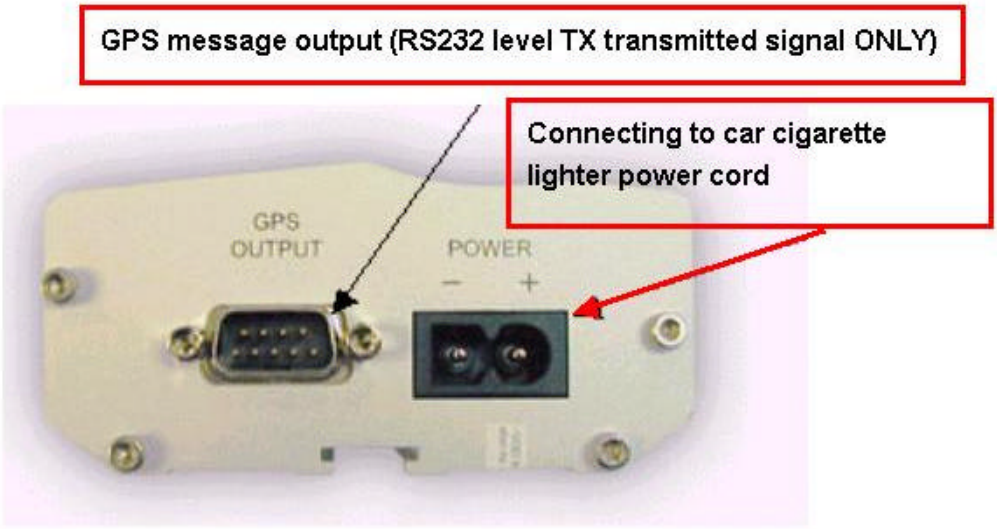
In addition to MMC card data recording and post-processing data analysis in host side, offers extended GPS messages output via RS232 level TX transmit signal. Users can order optional dedicated RS232 cable (Female-Female) transmit the GPS messages (NMEA-0183) to host side. In this case, real time monitoring with trajectory estimation becomes achievable.

Another special extended issue is 1 PPS signal output. But users should

consult with sales staff for more information.

Here is the summary of pin description as:

- Baud rate: 4800 bps
- Protocol: NMEA-0183
- RMC, GGA, GLL, GSA, GSV, VTG
- Signal: 8 N 1
- Signal Format: TX ONLY (RS232 level)
- P2: TX (Transmit Data)
- P5: Ground
- P9: 1 PPS signal output



3. Ordering Information

Users can refer the following ordering form to order **GMS-G** GPS MMC data logger product with standard package or optional accessories. The standard package consist of **GMS-G** unit, 5-meter GPS active antenna, Fixing peripherals (and screws), Car cigarette lighter power cord, and 32 MB MMC data logging card. As for optional extended GPS message output (see section 2.4), users should order another dedicated RS232 cable (Female-Female) to do real time monitoring. As for 1 PPS signal output requirement, please consult with sales staff for more information.

3.1 GMS-G Standard Package and Optional Accessories

Description	part number	Diagram or illustration
Standard package		
1. GMS-G package	1000150006	
Optional accessories		
1. Dedicated RS232 cable (Female-Female)	Upon customer's inquiry	
2. 1 PPS signal output	Upon customer' s inquiry	